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ABSTRACT

The purpose of this study was to investigate the achievement gap between minority and white students by analyzing 1996 and 2000 reading and mathematics scores on the Texas Assessment of Academic Skills (TAAS) at grades 5, 8, and 10. The focus was on score increases, the achievement gap between white and minority students, and whether or not a ceiling effect artificially restricts the distribution of students' scores on the TAAS. A causal-comparative research design was used to analyze the variables in the study using data for all Texas students in the Texas Education Agency accountability subset of TAAS scores in 1996 and 2000. The large gains found in this and other studies on the TAAS tests, which are minimum skills tests tailored to the Texas reading and mathematics curricula, have not been substantiated by other test results, such as the National Assessment of Educational Progress. While an explanation of these differences is beyond the score of this research, it is suggested that teaching to the TAAS is widespread and pervasive in Texas schools, and that the fact that Texas teachers and principals are evaluated based on students' TAAS scores contributes to the tendency to teach to the test. TAAS data form 2000 show that the differences between white and minority students' scores had decreased in comparison with 1996. However, since a larger percentage of white students than minority students achieved the maximum score on the test (the test ceiling), white students' scores likely underestimated their true achievement level. The ceiling effect artificially restricted the scores of white students and created the illusion that the achievement gap has been lessened. Because the test ceiling has differentially affected the scores for White, Hispanic, and African American students, the TAAS results cannot be used to determine whether or not the achievement gap has been narrowed. Implications for other states and testing programs are discussed. (Contains 14 tables and 10 references.) (SLD)

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Investigating the Achievement Gap Between White and Minority Students in Texas: Should We Be Concerned about a Ceiling Effect on the TAAS?

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Investigating the Achievement Gap Between White and Minority Students in Texas: Should We Be Concerned about a Ceiling Effect on the TAAS?

The Texas Assessment of Academic Skills (TAAS) has been administered as a measure of student achievement in Texas since 1990. The tests are an integral part of the state accountability system and are used as a key indicator in ranking schools as exemplary, recognized, acceptable, or low performing. The tests have been praised for providing disaggregated data for different ethnic groups and requiring each group to meet the same standard of proficiency. The disaggregated scores have been used to document and track an achievement gap between the scores of white and minority students. Many educators have credited the tests as fueling a drive to close this achievement gap.

Test results have typically been reported as percent of students passing (i.e. meeting minimum expectations) the TAAS. These results show that passing rates for minority students have increased at a faster rate than the passing rates for white students. (Table 1)

TABLE 1

Comparison of 1996 and 2000 Percent Passing
Reading

Grade Level	Ethnic Group	Percent Passing		Percent Gain
		1996	2000	
5	African-American	66.0%	79.3%	13.3%
	Hispanic	71.2%	81.6%	10.4%
	White	87.2%	93.9%	6.7%
8	African-American	59.8%	82.8%	23.0%
	Hispanic	61.9%	83.4%	21.5%
	White	85.9%	94.8%	8.9%
10	African-American	68.7%	85.2%	16.5%
	Hispanic	67.4%	82.7%	15.3%
	White	89.1%	95.9%	6.8%

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Table 2

Comparison of 1996 and 2000 Percent Passing Mathematics

Grade Level	Ethnic Group	Percent Passing 1996	Percent Passing 2000	Percent Gain
5	African-American	55.1%	83.5%	28.4%
	Hispanic	68.0%	89.2%	21.2%
	White	83.6%	95.8%	12.2%
8	African-American	43.8%	80.9%	37.1%
	Hispanic	51.4%	85.5%	34.1%
	White	77.7%	94.8%	17.1%
10	African-American	42.7%	73.8%	31.1%
	Hispanic	50.5%	80.1%	29.6%
	White	75.4%	92.9%	17.5%

Several studies have cited the increased percent of minority students passing the tests as evidence that the achievement gap is being closed (Jerald, 2001: Hurley, et.al. 2001: Texas Education Agency 2000). Other researchers argue that TAAS results are misleading and that the achievement gap is actually increasing (McNeil and Valenzuela, 2000; Haney, 2000; Klein, Hamilton, McCaffrey, and Stecher, 2000). Klein, et.al., in a comparative study of fourth and eighth grade reading and math, reported that the TAAS data showed that minority students were closing the achievement gap while National Assessment of Educational Progress (NAEP) data did not. They suggested that the large gains of minority students relative to white students on the TAAS could be due, at least in part, to a ceiling effect and teaching to the test. Linton and Kester (2002) also compared TAAS and NAEP results in a study of eighth grade mathematics. They concluded that, in contrast to TAAS results, NAEP data provided only marginal support for the view that minority students were closing the achievement gap. Their study included an analysis of the actual TAAS test score distribution for each ethnic group and found compelling evidence of a ceiling effect. To date, no other study has analyzed the actual distribution of test scores for each ethnic group as a means of investigating the achievement gap between minority and white students.

Purpose of the Study

The purpose of the present study was to investigate the achievement gap between minority and white students by analyzing 1996 and 2000 TAAS reading and mathematics scores at grade 5, 8, and 10. Specific research questions for the study were:

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1. Did African American, Hispanic, and white students' TAAS reading and TAAS math scores increase significantly between 1996 and 2000?

2. Does TAAS data show that the achievement gap between white and minority students decreased from 1996 to 2000?

3. Is there evidence that a ceiling effect artificially restricted the distribution of students' scores on the TAAS?

Methodology

A causal-comparative research design was used to analyze the variables in the study. The sample for the study consisted of all African-American, Hispanic, and white students in Texas who were in the Texas Education Agency (TEA) accountability subset of TAAS scores in grades 5, 8, and 10 in 1996 and 2000. Data were obtained from the Texas Education Agency's Public Education Information Management System (PEIMS) database. The data provided by TEA consisted of descriptive statistics and frequency counts of the number of African-American, Hispanic, and white students in Texas achieving each Texas Learning Index (TLI) score on the TAAS Reading Tests and TAAS Math Tests in grades 5, 8, and 10.

Two sets of analyses were used to compare scores within and between ethnic groups. First, confidence intervals were calculated and used to analyze differences between mean scores. A *d* statistic (Green, 2000. p. 151) was calculated to measure effect size for differences between mean scores. A chi-square test of independence was used to compare actual and expected frequencies for the test score distributions of white and minority students. A significant chi-square probability value suggests that there is a significant difference between observed and expected values and that the two variables (ethnicity and test scores) are not independent. The Cramer's V coefficient was calculated to estimate the strength of the relationship between ethnicity and test scores (Green, 2000, p. 347).

Research Question 1:

1. Did African American, Hispanic, and white students' TAAS reading and TAAS math scores increase significantly between 1996 and 2000?

The 1996 and 2000 TAAS reading and math scores for each ethnic group were analyzed in two ways. First, mean scores for each ethnic group were compared to determine if there were significant differences between the 1996 results and the 2000 results. Second, the test score distributions for each ethnic group for 1996 and 2000 were compared to determine changes in the score distribution pattern over time.

TAAS Reading Test

The comparison of 1996 and 2000 mean scores for each ethnic group on the TAAS Reading Test is presented in Table 2. Results indicate that:

- Mean scores for reading increased significantly for each ethnic group at all three grade levels
- At every grade level, mean score gains for white students were smaller than the gains for Hispanic and African American students
- Effect sizes for comparison of 1996 and 2000 reading scores, measured by the d-statistic, were moderate ranging from .41 to .65.

TABLE 3

Comparison of 1996 and 2000 TLI Mean Scores
Reading

Grade Level	Ethnic Group	Mean TLI Scores 1996	2000	Gain	Effect Size (*d* statistic)
5	African-American	73.6	81.0	7.4**	.453
	Hispanic	75.7	82.2	6.5**	.417
	White	84.2	90.1	5.9**	.466
8	African-American	72.0	81.8	9.8**	.653
	Hispanic	72.8	82.0	9.2**	.617
	White	83.7	89.4	5.7**	.483
10	African-American	74.2	81.3	7.1**	.497
	Hispanic	73.6	80.1	6.5**	.430
	White	83.6	88.6	5.0**	.463

** = < .01

The second set of TAAS analyses compared the 1996 and 2000 reading score distributions for each ethnic group (Table 4). A chi-square analysis indicated that the score distributions for each ethnic group changed significantly from 1996 to 2000. Results of the analyses are presented in Table 5.

- The 1996 and 2000 distributions of scores for each ethnic group differed significantly at all 3 grade levels.

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- Scores for Hispanic and African American students tended to increase from the lower portion to the middle and upper portion of the score range.
- Scores for white students were concentrated in the upper portion of the score range in both 1996 and 2000.
- Effect size as measured by Cramer's V coefficient indicated that there was moderate change for each ethnic group at each grade level.

Table 4

1996 and 2000 TLI Score Distributions
Reading

Grade	Ethnic Group		TLI Score						
			0-69	70-74	75-79	80-84	85-89	90-94	95+
5	African-Am.	1996	34.0%	12.3%	10.0%	12.1%	13.5%	6.7%	11.4%
		2000	20.7%	5.8%	11.7%	10.5%	19.2%	15.0%	17.1%
	Hispanic	1996	28.8%	12.5%	10.8%	13.0%	14.8%	7.5%	12.6%
		2000	18.4%	5.5%	11.1%	10.3%	19.8%	16.0%	18.9%
	White	1996	12.8%	7.6%	7.9%	12.0%	18.2%	11.9%	29.7%
		2000	6.1%	2.4%	5.7%	6.4%	16.7%	20.3%	42.3%
8	African-Am.	1996	40.2%	11.2%	11.7%	12.5%	8.5%	11.0%	4.9%
		2000	17.2%	7.5%	10.2%	13.6%	17.0%	19.9%	14.6%
	Hispanic	1996	38.1%	11.1%	11.9%	12.8%	9.0%	11.8%	5.3%
		2000	16.6%	7.7%	10.2%	13.4%	16.5%	19.6%	16.0%
	White	1996	14.1%	6.1%	8.7%	13.2%	12.8%	25.7%	19.4%
		2000	5.2%	3.1%	4.9%	8.3%	14.7%	27.7%	36.0%
10	African-Am.	1996	31.3%	12.5%	9.6%	16.7%	16.8%	8.9%	4.2%
		2000	14.8%	8.3%	12.0%	15.0%	18.5%	25.6%	5.8%
	Hispanic	1996	32.6%	11.6%	9.6%	16.1%	16.7%	9.0%	4.5%
		2000	17.3%	8.9%	12.0%	15.1%	17.4%	23.1%	6.2%
	White	1996	10.9%	6.7%	7.0%	16.1%	24.5%	20.2%	14.6%
		2000	4.1%	2.8%	5.2%	9.2%	16.5%	41.6%	20.6%

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TABLE 5

Comparison of 1996 and 2000 TLI Score Distributions
Reading

Grade	Group	Significance Level	Effect Size (Cramer's V)
5	African-American 1996-2000	<.01	.235
	Hispanic 1996-2000	<.01	.227
	White 1996-2000	<.01	.239
8	African-American 1996-2000	<.01	.289
	Hispanic 1996-2000	<.01	.306
	White 1996-2000	<.01	.254
10	African-American 1996-2000	<.01	.278
	Hispanic 1996-2000	<.01	.242
	White 1996-2000	<.01	.290

TAAS Math Test

The comparison of 1996 and 2000 mean scores for each ethnic group on the TAAS math test is presented in Table 6. Results indicate that:

- Mean scores for math increased significantly for each ethnic group at all three grade levels
- At every grade level, mean score gains for white students were smaller than the gains for Hispanic and African American students
- Effect sizes for comparison of 1996 and 2000 math scores, measured by the d-statistic, were larger for African American and Hispanic students than for white students.

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Table 6

Comparison of 1996 and 2000 TLI Mean Scores
Mathematics

Grade Level	Ethnic Group	Mean TLI Scores 1996	2000	Gain	Effect Size (*d* statistic)
5	African-American	68.8	79.7	10.9**	.799
	Hispanic	73.5	82.5	9.0**	.731
	White	79.5	86.1	6.6**	.664
8	African-American	65.0	77.2	12.2**	.916
	Hispanic	67.8	79.3	11.5**	.894
	White	77.2	84.2	7.0**	.667
10	African-American	64.8	75.5	10.7**	.497
	Hispanic	67.7	77.4	9.7**	.430
	White	76.3	83.2	6.9**	.463

** = < .01

The second set of TAAS analyses compared the 1996 and 2000 score distributions for each ethnic group (Table 7). A chi-square analysis indicated that the score distributions for each ethnic group changed significantly from 1996 to 2000. Results of the analyses are presented in Tables 8.

- The 1996 and 2000 distributions of scores for each ethnic group differed significantly at all 3 grade levels.
- Scores for Hispanic and African American students tended to increase from the lowest score range to middle and upper portion of the score range.
- Scores for white students were concentrated in the upper portion of the score range.
- Effect size as measured by the Cramer's V coefficient indicated that there was moderate gain for each ethnic group at each grade level. However in grades 5 and 8, there was a greater change in the distributions of scores for African American and Hispanic students than for white students

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Table 7

1996 and 2000 TLI Score Distributions
Mathematics

Grade	Ethnic Group		TLI Score					
			0-69	70-74	75-79	80-84	85-89	90-94
5	African-Am.	1996	44.9%	13.2%	11.4%	11.6%	16.4%	2.5%
		2000	16.5%	7.7%	11.4%	16.9%	30.8%	16.6%
	Hispanic	1996	32.0%	12.3%	11.9%	14.1%	24.7%	5.1%
		2000	10.8%	5.8%	9.3%	15.1%	34.5%	24.6%
	White	1996	16.4%	9.5%	10.7%	15.1%	37.6%	10.8%
		2000	4.2%	3.1%	5.6%	11.7%	38.1%	37.1%
8	African-Am.	1996	56.2%	11.8%	12.0%	10.6%	7.4%	2.0%
		2000	19.1%	11.3%	18.4%	24.4%	20.9%	6.0%
	Hispanic	1996	48.6%	11.9%	13.1%	12.9%	10.3%	3.3%
		2000	14.5%	9.0%	16.3%	24.9%	26.0%	9.4%
	White	1996	22.3%	10.0%	13.9%	19.6%	23.2%	11.0%
		2000	5.2%	3.9%	9.1%	21.4%	37.9%	22.5%
10	African-Am.	1996	57.3%	10.2%	9.9%	12.2%	9.1%	1.2%
		2000	26.2%	10.3%	13.2%	20.8%	24.6%	4.8%
	Hispanic	1996	49.5%	10.7%	11.3%	14.3%	12.0%	2.1%
		2000	19.9%	8.9%	12.3%	21.4%	30.1%	7.5%
	White	1996	24.6%	9.6%	12.8%	21.6%	25.7%	5.7%
		2000	7.1%	4.7%	8.2%	19.5%	43.0%	17.5%

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TABLE 8

Comparison of 1996 and 2000 TLI Score Distributions
Mathematics

Grade	Group	Significance Level	Effect Size (Cramer's V)
5	African-American 1996-2000	<.01	.405
	Hispanic 1996-2000	<.01	.410
	White 1996-2000	<.01	.332
8	African-American 1996-2000	<.01	.410
	Hispanic 1996-2000	<.01	.405
	White 1996-2000	<.01	.332
10	African-American 1996-2000	<.01	.343
	Hispanic 1996-2000	<.01	.353
	White 1996-2000	<.01	.377

Conclusions

Mean reading and math scores increased significantly for African American, Hispanic, and white students at all three grade levels. Mean gains were higher for African American and Hispanic groups at each grade level for both reading and math. The effect size was large for both the African American and Hispanic students and medium for white students, indicating that the differences between the 1996 and 2000 mean scores were meaningful.

Analysis of the reading and math score distributions for each ethnic group revealed that, at each grade level, the distributions changed significantly from 1996 to 2000. Furthermore, the pattern of change was different for the minority students and the white students. In 2000, both the reading and math score distributions showed a large decrease in the percentage of African American and Hispanic students scoring below a TLI of 70 (i.e. failed the test) and an increase in the percentage of scores in the middle to high range. For white students, the percentage of scores at the lower and middle range decreased and the percentage at the top of the test score range showed a very large increase.

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Research Question 2:

Does TAAS data show that the achievement gap between white and minority students decreased from 1996 to 2000?

TAAS Reading

The comparison of mean scores for white and minority students on the TAAS Reading Test is presented in Table 9. Confidence intervals were used to determine the statistical significance of differences between white and minority students' mean scores in 1996 and in 2000.

- Mean scores for white students were significantly higher than African American students in both 1996 and 2000.
- The difference between mean scores for white and African American students was larger in 1996 than in 2000.
- Mean scores for white students were significantly higher than Hispanic students in both 1996 and 2000.
- The difference between mean scores for white and Hispanic students was larger in 1996 than in 2000.
- Effect sizes for the comparison between mean scores for white and minority students were medium to large in both 1996 and 2000.
- Effect sizes were larger for African American vs. white students than for Hispanic vs. white students at grades 5 and 8.

TABLE 9

Comparison of Mean TLI Score For White and Minority Students Reading

Grade Level	Comparison Group	Mean Difference	Effect Size (*d* statistic)
5	African-American vs. White 1996	10.6**	.711
	African-American vs. White 2000	9.1**	.761
	Hispanic vs. White 1996	8.5**	.560
	Hispanic vs. White 2000	7.9**	.627
8	African-American vs. White 1996	11.7**	.835
	African-American vs. White 2000	7.6**	.696
	Hispanic vs. White 1996	10.9**	.751
	Hispanic vs. White 2000	7.4**	.631
10	African-American vs. White 1996	9.4**	.725
	African-American vs. White 2000	7.3**	.724
	Hispanic vs. White 1996	10.0**	.715
	Hispanic vs. White 2000	8.5**	.756

** <.01

A chi-square analysis was used to compare the score distribution for white students with the score distributions for Hispanic students and African American students. Results of the analyses are presented in Table 10.

- The score distribution for white students was significantly different from the score distributions for African American students both 1996 and 2000.
- The score distribution for white students was significantly different from the score distributions for Hispanic students both 1996 and 2000.
- Effect sizes were medium, with small fluctuations from grade level to grade level. Effect size increased slightly from 1996 to 2000 in grades 5 and 10 and decreased in grade 8.

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- Overall indications are that, although the distribution patterns changed, the white students' scores and minority students' scores did not become more similar from 1996 to 2000.

TABLE 10

Comparison of Score Distributions For White and Minority Students Reading

Grade Level	Comparison Group	Significance Level	Effect Size (Cramer's V)
5	African-American vs. White 1996	<.01	.277
	African-American vs. White 2000	<.01	.306
	Hispanic vs. White 1996	<.01	.276
	Hispanic vs. White 2000	<.01	.312
8	African-American vs. White 1996	<.01	.365
	African-American vs. White 2000	<.01	.285
	Hispanic vs. White 1996	<.01	.418
	Hispanic vs. White 2000	<.01	.316
10	African-American vs. White 1996	<.01	.286
	African-American vs. White 2000	<.01	.299
	Hispanic vs. White 1996	<.01	.338
	Hispanic vs. White 2000	<.01	.376

TAAS Math Test

The comparison of mean scores for white and minority students on the TAAS presented in Table 11. Confidence intervals were used to determine the statistical significance of differences between white and minority students' mean scores in 1996 and in 2000.

- Mean scores for white students were significantly higher than African American students in both 1996 and 2000.

- The difference in mean scores between white and African American students was larger in 1996 than in 2000.

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- Mean scores for white students were significantly higher than Hispanic students in both 1996 and 2000.
- The difference in mean scores between white and Hispanic students was larger in 1996 than in 2000.
- Effect sizes were medium to large in both 1996 and 2000.
- Effect sizes were larger for African American vs. white students than for Hispanic vs. white students at all three grade levels.

TABLE 11

Comparison of Mean TLI Score For White and Minority Students Mathematics

Grade Level	Comparison Group	Mean Difference	Effect Size (*d* statistic)
5	African-American vs. White 1996	10.7**	.848
	African-American vs. White 2000	6.4**	.735
	Hispanic vs. White 1996	6.0**	.468
	Hispanic vs. White 2000	3.6**	.406
8	African-American vs. White 1996	12.2**	.601
	African-American vs. White 2000	7.0**	.528
	Hispanic vs. White 1996	9.4**	.473
	Hispanic vs. White 2000	4.9**	.374
10	African-American vs. White 1996	11.5**	.875
	African-American vs. White 2000	7.7**	.817
	Hispanic vs. White 1996	8.6**	.635
	Hispanic vs. White 2000	5.8**	.550

** <.01

A chi-square analysis was used to compare the score distribution for white students with the score distributions for Hispanic students and African American students. Results of the analyses are presented in Table 12.

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- The score distribution for white students was significantly different from the score distributions for African American students both 1996 and 2000.

- The score distribution for white students was significantly different from the score distributions for Hispanic students both 1996 and 2000.

- Effect sizes for Hispanic vs. white students were smaller in grade 5 than in grades 8 and 10. The effect size for African American vs. white students was similar at all three grade levels.

- Effect sizes were medium in all three grade levels, with small fluctuations from 1996 and 2000.

- Although the score distribution patterns for each group changed significantly from 1996 to 2000, the effect size indicated that the white students' scores and minority students' scores became only slightly more similar from 1996 to 2000.

TABLE 12

Comparison of Score Distributions For White and Minority Students
Mathematics

Grade	Comparison Group	Significance Level	Effect Size (Cramer's V)
5	African-American vs. White 1996	<.01	.315
	African-American vs. White 2000	<.01	.293
	Hispanic vs. White 1996	<.01	.220
	Hispanic vs. White 2000	<.01	.197
8	African-American vs. White 1996	<.01	.331
	African-American vs. White 2000	<.01	.333
	Hispanic vs. White 1996	<.01	.313
	Hispanic vs. White 2000	<.01	.286
10	African-American vs. White 1996	<.01	.300
	African-American vs. White 2000	<.01	.314
	Hispanic vs. White 1996	<.01	.280
	Hispanic vs. White 2000	<.01	.268

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Conclusions

The TAAS results for both reading and math show that the difference in mean scores for white and minority students was smaller in 2000 than in 1996. This would seem to indicate that minority students were closing the achievement gap in both subjects. However, comparison of the score distributions of white and minority students presents a somewhat different picture. Chi square comparisons between the score distributions of white students and minority students showed only small differences in effect sizes from 1996 to 2000. This indicates that even though the score distributions of both white and minority students changed from 1996 to 2000, their score distributions remained very different.

Research Question 3:

Is there evidence that a ceiling effect artificially restricted the distribution of students' scores on the TAAS?

In reading, white students gained between 5 and 6 TLI points from 1996 to 2000 while African Americans gained from 7 to 9 TLI and Hispanic students gained between 6 and 9 TLI points. Similarly, in math white students gained between 6 and 7 TLI points while African American students gained from 10 to12 points and Hispanic students gained from 9 to 11 points.

White students' mean scores in both reading and math were higher than the mean scores for minority students, and were within 10%-15% of the maximum score (ceiling) of the test. Because the mean scores for white students were higher than the mean scores for minority students, it is likely that a larger percentage of white students' scores were restricted by the test ceiling and were unable to demonstrate their true achievement level. If this occurred, the white students' test score distributions would have been negatively skewed, causing their mean scores to be unduly influenced by scores in the lower end of the score range. The result would be that the mean scores for white students were artificially depressed. Under these circumstances, comparison of their mean scores with the mean scores of African American and Hispanic students (whose mean scores were affected to a lesser degree) would create the appearance that the minority students were achieving at a greater rate and therefore closing the achievement gap.

The actual test score distribution for each ethnic group were also analyzed for evidence of a ceiling effect. These analyses, presented in Tables 13 and 14, gives the percent of students in each ethnic group with TLI scores in the upper 10% of the score range (i.e. a TLI above 85 for math and above 90 for reading). The tables show that the percentage of white students with test scores in the upper 10% of the score range increased from 35-45% in 1996 to 60-65% in 2000. In contrast, the percentage of minority students with

scores in the top 10% of the score range increased from 10-20% in 1996 to 30-35% in 2000. In effect, over the last 4 years, a much larger percent of the white students' scores have "piled up" at the top of the test score range.

The dramatic difference in the score distributions for white and minority students provides support for the hypothesis that a ceiling effect has restricted white student' scores to a greater degree than it has restricted Hispanic and African American students scores. If this hypothesis is correct, the result would be an artificial narrowing of the achievement gap between white and minority students' reading and math test scores.

Table 13

Percent of Students with TAAS TLI Scores Greater Than 90

Grade Level	Reading	TLI Scores		Cumulative Total
		90-94	95 +	
5	African-American 1996	6.7%	11.4%	18.1%
	African-American 2000	15.0%	17.1%	32.1%
	Hispanic 1996	7.5%	12.6%	20.1%
	Hispanic 2000	16.0%	18.9%	34.9%
	White 1996	11.9%	29.7%	41.6%
	White 2000	20.3%	42.3%	62.6%
8	African-American 1996	11.0%	4.9%	15.9%
	African-American 2000	19.9%	14.6%	34.5%
	Hispanic 1996	11.8%	5.3%	17.1%
	Hispanic 2000	19.6%	16.0%	35.6%
	White 1996	25.7%	19.4%	45.1%
	White 2000	27.7%	36.0%	63.7%
10	African-American 1996	8.9%	4.2%	13.1%
	African-American 2000	25.6%	5.8%	31.4%
	Hispanic 1996	9.0%	4.5%	13.5%
	Hispanic 2000	23.1%	6.2%	29.3%
	White 1996	20.2%	14.6%	34.8%
	White 2000	41.6%	20.6%	62.2%

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Table 14

Percent of Students with TAAS TLI Scores Greater Than 84

Grade Level	Math	TLI Scores		Cumulative Total
		85-89	90-94	
5	African-American 1996	16.4%	2.5%	18.9%
	African-American 2000	30.8%	16.6%	47.4%
	Hispanic 1996	24.7%	5.1%	29.8%
	Hispanic 2000	34.5%	24.6%	59.1%
	White 1996	37.6%	10.8%	48.6%
	White 2000	38.1%	37.1%	75.2%
8	African-American 1996	7.4%	2.0%	9.4%
	African-American 2000	20.9%	6.0%	26.9%
	Hispanic 1996	10.3%	3.3%	13.6%
	Hispanic 2000	26.0%	9.4%	35.4%
	White 1996	23.2%	11.0%	34.2%
	White 2000	37.9%	22.5%	60.4%
10	African-American 1996	9.1%	1.2%	10.3%
	African-American 2000	24.6%	4.8%	29.4%
	Hispanic 1996	12.0%	2.1%	14.1%
	Hispanic 2000	30.1%	7.5%	37.6%
	White 1996	25.7%	5.7%	31.4%
	White 2000	43.0%	17.5%	60.5%

Discussion

The large gains reported here and in other studies (Hurley, 2001; Jerald, 2000; Linton and Kester, 2002) on the TAAS tests, which are minimum skills tests tailored specifically to the Texas reading and mathematics curricula, have not been substantiated by other test results. Klein, et.al. (2000) in a study of 4th and 8th grade reading and math reported large gains on the TAAS but little or no gain on the National Assessment of Educational

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Progress (NAEP) over a 4 year period. Linton and Kester, in a study of eighth grade mathematics found large TAAS gains and small NAEP gains from 1996 to 2000.

While an explanation of the reasons for the differences in gains on the TAAS and NAEP reported in these two studies is beyond the scope of this research, the authors' experience in Texas public schools suggests two likely answers. First, teaching to the TAAS is widespread and pervasive in Texas schools. Release versions of the TAAS are available from the Texas Education Agency (along with scoring services that mimic actual TAAS reports) as are a variety of commercially developed practice and test preparation materials. It is common practice for schools to administer one (or more) "practice TAAS" in the fall and use the results to guide instruction in preparation for the state-mandated TAAS tests in the spring. Second, Texas teachers and principals are evaluated, in part, on their students' success (or lack of success) on the TAAS. The combination of the availability of TAAS materials and the threat of professional censure create very strong pressure to teach to the test.

TAAS data for 2000 revealed that differences between white and minority students' scores had decreased when compared to 1996. Other studies have considered this as evidence that the achievement gap between white and minority students is being narrowed. However, analysis of the distribution of scores for each ethnic group reveal that over 60% of white students scored in the upper 10% of the test score range while about 30% of the minority students scored in this range.

Since a larger percentage of white students than minority students achieved the maximum score on the test (the test ceiling), white students' scores likely underestimated their true achievement level. That is, the ceiling effect has artificially restricted white students scores and created the illusion that the achievement gap has been narrowed. The presence of a ceiling effect casts doubt on the validity of claims that the achievement gap between white and minority students has been narrowed. A more reasonable interpretation of the available data is that because the test ceiling has differentially affected the scores for white, Hispanic, and African American students, TAAS results cannot be used to determine whether or not the achievement gap has been narrowed.

The results of this study would seem to have implications beyond the State of Texas. Because of the national emphasis on standards and the use of high stakes criterion-referenced tests to measure progress toward those standards, the possibility of test score inflation and ceiling effects pose serious dangers. High stakes test results are being used more and more frequently by national, state, and local decision-makers to develop educational policy, formulate curricula, and fund educational initiatives that have far reaching consequences for the nations schools. Basing these decisions on inflated, faulty or flawed test data can do irreparable harm to a generation of students.

Notes

1. A ceiling effect occurs when the range of difficulty of the items on a test is limited, and therefore scores at the higher end of the possible score continuum are artificially restricted (Gall, Borg, and Joyce, 1996). The TAAS Technical Manual (TEA, 2001) cautions the test user about the difficulty of interpreting TLI scores at extreme ends of the distribution. The TAAS manual notes that if a student scores the maximum TLI on a test, there is no way of knowing whether, if the test had had more items, the students would have answered those items correctly and achieved a higher TLI. However, this caution has not been included in TAAS reports prepared by TEA.

2. TAAS data was ordered as a customized report of frequency distributions by ethnic group. The data set for each ethnic group consisted of a frequency count of the number of students by Texas Learning Index (TLI) score together with the mean, standard deviation, and SEM of the distribution. The data set consisted of over 250,000 scores at each grade level.

3. The Texas Learning Index (TLI) is an equal interval scale and can be used to statistically analyze test scores. It is unique to Texas and is used only with the TAAS reading and math tests. A complete description of the derivation of the TLI is contained in the TAAS Technical Digest available from the following Texas Education Agency web site. (http://www.tea.state.tx.us/student.assessment/researchers.html)

3. The *d* statistic is the ratio of the mean difference between two groups divided by the pooled standard deviation. A value of .2, .5, or .8 is generally interpreted as small, medium, or large effect size, respectively.

4. The Cramer's V coefficient is a rescale of the phi coefficient and has a range between 0 and 1. A Cramer's V of .1, .3, or .5 is generally interpreted as small, medium, or large effect size, respectively.

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Table 1

TAAS Reading Test: A Comparison of Percent Passing for 1996 and 2000 by Ethnic Group

Grade Level	Ethnic Group	Percent Passing		Percent Gain
		1996	2000	
5	African-American	66.0%	79.3%	13.3%
	Hispanic	71.2%	81.6%	10.4%
	White	87.2%	93.9%	6.7%
8	African-American	59.8%	82.8%	23.0%
	Hispanic	61.9%	83.4%	21.5%
	White	85.9%	94.8%	8.9%
10	African-American	68.7%	85.2%	16.5%
	Hispanic	67.4%	82.7%	15.3%
	White	89.1%	95.9%	6.8%

Table 2

TAAS Mathematics Test: A Comparison of Percent Passing for 1996 and 2000 by Ethnic Group

Grade Level	Ethnic Group	Percent Passing		Percent Gain
		1996	2000	
5	African-American	55.1%	83.5%	28.4%
	Hispanic	68.0%	89.2%	21.2%
	White	83.6%	95.8%	12.2%
8	African-American	43.8%	80.9%	37.1%
	Hispanic	51.4%	85.5%	34.1%
	White	77.7%	94.8%	17.1%
10	African-American	42.7%	73.8%	31.1%
	Hispanic	50.5%	80.1%	29.6%
	White	75.4%	92.9%	17.5%

Table 3

Comparison of TAAS TLI Mean Scores for 1996 and 2000 in Reading:

By Ethnic Group

Grade	Ethnicity	Mean TLI Scores		Gain	Effect Size
		1996	2000		(d Statistic)
5	African American	73.6	81.0	+ 7.4 [a]	.453
	Hispanic	75.7	82.2	+ 6.5 [a]	.417
	White	84.2	90.1	+5.9 [a]	.466
8	African American	72.0	81.8	+ 9.8 [a]	.653
	Hispanic	72.8	82.0	+ 9.2	.617
	White	83.7	89.4	+ 5.7	.483
10	African American	74.2	81.3	+ 7.1 [a]	.497
	Hispanic	73.6	80.1	+ 6.5 [a]	.430
	White	83.6	88.6	+ 5.0	.463

a <.01

TABLE 4

TAAS Reading TLI Score Distributions for 1996 and 2000: Percent of Students by TLI

Grade Level	Ethnic Group		TLI Score						
			0-69	70-74	75-79	80-84	85-89	90-94	95+
5	African-Am.	1996	34.0	12.3	10.0	12.1	13.5	6.7	11.4
		2000	20.7	5.8	11.7	10.5	19.2	15.0	17.1
5	Hispanic	1996	28.8	12.5	10.8	13.0	14.8	7.5	12.6
		2000	18.4	5.5	11.1	10.3	19.8	16.0	18.9
5	White	1996	12.8	7.6	7.9	12.0	18.2	11.9	29.7
		2000	6.1	2.4	5.7	6.4	16.7	20.3	42.3
8	African-Am.	1996	40.2	11.2	11.7	12.5	8.5	11.0	4.9
		2000	17.2	7.5	10.2	13.6	17.0	19.9	14.6
8	Hispanic	1996	38.1	11.1	11.9	12.8	9.0	11.0	5.3
		2000	16.6	7.7	10.2	13.4	16.5	19.6	16.0
8	White	1996	14.1	6.1	8.7	13.2	12.8	25.7	19.4
		2000	5.2	3.1	4.9	8.3	14.7	27.7	36.0
10	African-Am.	1996	31.3	12.5	9.6	16.7	16.8	8.9	4.2
		2000	14.8	8.3	12.0	15.0	18.5	25.6	5.8
10	Hispanic	1996	32.6	11.6	9.6	16.1	16.7	9.0	4.5
		2000	17.3	8.9	12.0	15.1	17.4	23.1	6.2

10	White	1996	10.9	6.7	7.0	16.1	24.5	20.2	14.6
		2000	4.1	2.8	5.2	9.2	16.5	41.6	20.6

Table 5

Comparison of TAAS Reading Score Distributions For 1996 and 2000 Within Each Ethnic Group

Grade	Group	Significance Level	Effect Size (Cramer's V)
5	White 1996-2000	<.01	.235
	African-American 1996-2000	<.01	.227
	Hispanic 1996-2000	<.01	.239
8	White 1996-2000	<.01	.289
	African-American 1996-2000	<.01	.306
	Hispanic 1996-2000	<.01	.254
10	White 1996-2000	<.01	.278
	African-American 1996-2000	<.01	.242
	Hispanic 1996-2000	<.01	.290

Table 6

Comparison of TAAS TLI Mean Scores for 1996 and 2000 in Math:

By Ethnic Group

Grade	Ethnicity	Mean TLI Scores		Gain	Effect Size
		1996	2000		(d Statistic)
5	African American	68.8	79.7	+10.9[a]	.799
	Hispanic	73.5	82.5	+ 9.0[a]	.731
	White	79.5	86.1	+ 6.6[a]	.664
8	African American	65.0	77.2	+12.2[a]	.916
	Hispanic	67.8	79.3	+11.5[a]	.894
	White	77.2	84.2	+7.0[a]	.667
10	African American	64.8	75.5	+10.7[a]	.497
	Hispanic	67.7	77.4	+ 9.7[a]	.430
	White	76.3	83.2	+ 6.9[a]	.463

a <.01

TABLE 7

TAAS Math TLI Score Distributions for 1996 and 2000: Percent of Students by TLI

Grade	Ethnic Group		TLI Score					
			0-69	70-74	75-79	80-84	85-89	90-94
5	African-Am.	1996	44.9	13.2	11.4	11.6	16.4	2.5
		2000	16.5	7.7	11.4	16.9	30.8	16.6
5	Hispanic	1996	32.0	12.3	11.9	14.1	24.7	5.1
		2000	10.8	5.8	9.3	15.1	34.5	24.6
5	White	1996	16.4	9.5	10.7	15.1	37.6	10.8
		2000	4.2	3.1	5.6	11.7	38.1	37.1
8	African-Am.	1996	56.2	11.8	12.0	10.6	7.4	2.0
		2000	19.1	11.3	18.4	24.4	20.9	6.0
8	Hispanic	1996	48.6	11.9	13.1	12.9	10.3	3.3
		2000	14.5	9.0	16.3	24.9	26.0	9.4
8	White	1996	22.3	10.0	13.9	19.6	23.2	11.0
		2000	5.2	3.9	9.1	21.4	37.9	22.5
10	African-Am.	1996	57.3	10.2	9.9	12.2	9.1	1.2
		2000	26.2	10.3	13.2	20.8	24.6	4.8
10	Hispanic	1996	49.5	10.7	11.3	14.3	12.0	2.1
		2000	19.9	8.9	12.3	21.4	30.1	7.5
10	White	1996	24.6	9.6	12.8	21.6	25.7	5.7
		2000	7.1	4.7	8.2	19.5	43.0	17.5

Table 8

Comparison of TAAS Math Score Distributions For 1996 and 2000

Within Each Ethnic Group

Grade	Group	Significance Level	Effect Size (Cramer's V)
5	White 1996-2000	<.01	.405
	African-American 1996-2000	<.01	.410
	Hispanic 1996-2000	<.01	.332
8	White 1996-2000	<.01	.410
	African-American 1996-2000	<.01	.405
	Hispanic 1996-2000	<.01	.332
10	White 1996-2000	<.01	.343
	African-American 1996-2000	<.01	.353
	Hispanic 1996-2000	<.01	.377

Table 9

Comparison of TAAS Mean TLI Reading Score For White and Minority Students

Grade	Comparison Group	Mean Difference	Effect Size (d Statistic)
5	African Am. vs. White 1996	10.6[a]	.711
	African Am. vs. White 2000	9.1[a]	.761
	Hispanic vs. White 1996	8.5[a]	.560
	Hispanic vs. White 2000	7.9[a]	.627
8	African Am. vs. White 1996	11.7[a]	.835
	African Am. vs. White 2000	7.6[a]	.696
	Hispanic vs. White 1996	40.9[a]	.751
	Hispanic vs. White 2000	7.4[a]	.631
10	African Am. vs. White 1996	9.4[a]	.725
	African Am. vs. White 2000	7.3[a]	.724
	Hispanic vs. White 1996	10.0[a]	.715
	Hispanic vs. White 2000	8.5[a]	.756

a <.01

Table 10

Comparison of TAAS Math Score Distributions For White and Minority Students

Grade	Comparison Group	Significance Level	Effect Size (Cramer's V)
5	African Am. vs. White 1996	<.01	.277
	African Am. vs. White 2000	<.01	.306
	Hispanic vs. White 1996	<.01	.276
	Hispanic vs. White 2000	<.01	.312
8	African Am. vs. White 1996	<.01	.365
	African Am. vs. White 2000	<.01	.285
	Hispanic vs. White 1996	<.01	.418
	Hispanic vs. White 2000	<.01	.316
10	African Am. vs. White 1996	<.01	.286
	African Am. vs. White 2000	<.01	.299
	Hispanic vs. White 1996	<.01	.338
	Hispanic vs. White 2000	<.01	.376

Table 11

Comparison of TAAS Mean TLI Math Score For White and Minority Students

Grade	Comparison Group	Mean Difference	Effect Size (d Statistic)
5	African Am. vs. White 1996	10.7[a]	.848
	African Am. vs. White 2000	6.4[a]	.735
	Hispanic vs. White 1996	6.0[a]	.468
	Hispanic vs. White 2000	3.6[a]	.406
8	African Am. vs. White 1996	12.2[a]	.601
	African Am. vs. White 2000	7.0[a]	.528
	Hispanic vs. White 1996	9.4[a]	.473
	Hispanic vs. White 2000	4.9[a]	.374
10	African Am. vs. White 1996	11.5[a]	.875
	African Am. vs. White 2000	7.7[a]	.817
	Hispanic vs. White 1996	8.6[a]	.635
	Hispanic vs. White 2000	5.8[a]	.550

a < .01

Table 12

Comparison of TAAS Math Score Distributions For White and Minority Students

Grade	Comparison Group	Significance Level	Effect Size (Cramer's V)
5	African Am. vs. White 1996	<.01	.315
	African Am. vs. White 2000	<.01	.293
	Hispanic vs. White 1996	<.01	.220
	Hispanic vs. White 2000	<.01	.197
8	African Am. vs. White 1996	<.01	.331
	African Am. vs. White 2000	<.01	.333
	Hispanic vs. White 1996	<.01	.313
	Hispanic vs. White 2000	<.01	.286
10	African Am. vs. White 1996	<.01	.300
	African Am. vs. White 2000	<.01	.314
	Hispanic vs. White 1996	<.01	.280
	Hispanic vs. White 2000	<.01	.268

Table 13

Percent of Students with TAAS TLI Scores Greater Than or Equal to 90

Grade	Reading	TLI Scores		Cumulative
		90-94	95 +	Total
5	African American 1996	6.7	11.4	18.1
	African American 2000	15.0	17.1	32.1
5	Hispanic 1996	7.5	12.6	20.1
	Hispanic 2000	16.0	18.9	34.9
5	White 1996	11.9	29.7	41.6
	White 2000	20.3	42.3	62.6
8	African American 1996	11.0	4.9	15.9
	African American 2000	19.9	14.6	34.5
8	Hispanic 1996	11.8	5.3	17.1
	Hispanic 2000	19.6	16.0	35.6
8	White 1996	25.7	19.4	45.1
	White 2000	27.7	36.0	63.7
10	African American 1996	8.9	4.2	13.1
	African American 2000	25.6	5.8	31.4
10	Hispanic 1996	9.0	4.5	13.5
	Hispanic 2000	23.1	6.2	29.3
10	White 1996	20.2	14.6	34.8
	White 2000	41.6	20.6	62.2

Table 14

Percent of Students with TAAS TLI Scores Greater Than 84

Grade	Reading	TLI Scores		Cumulative
		85-89	90-94	Total
5	African American 1996	16.4	2.5	18.9
	African American 2000	30.8	16.6	47.4
5	Hispanic 1996	24.7	5.1	29.8
	Hispanic 2000	34.5	24.6	59.1
5	White 1996	37.6	10.8	48.6
	White 2000	38.1	37.1	75.2
8	African American 1996	7.4	2.0	9.4
	African American 2000	20.9	6.0	26.9
8	Hispanic 1996	10.3	3.3	13.6
	Hispanic 2000	26.0	9.4	35.4
8	White 1996	23.2	11.0	34.2
	White 2000	37.9	22.5	60.4
10	African American 1996	9.1	1.2	10.3
	African American 2000	24.6	4.8	29.4
10	Hispanic 1996	12.0	2.1	14.1
	Hispanic 2000	30.1	7.5	37.6
10	White 1996	25.7	5.7	31.4
	White 2000	43.0	17.5	60.5

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